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PRACTICAL EXERCISES ON TOPOGRAPHIC MAPS

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THE EDUCATIONAL VALUE OF TOPOGRAPHIC MAPS

THE topographic maps now published by the United States Geological Survey are already widely used in schools and colleges as the basis of practical exercises in physical geography; but in some cases that have come to my attention, it has seemed as if the exercises based on the maps were not well planned, and in no case did they nearly exhaust the valuable lessons that such maps may teach. The construction of transverse profiles by platting the heights, taken from map contours, on cross section paper, is a time-consuming exercise, perhaps helpful once or twice but likely to be carried too far. The study of land and water forms on these or on any similar maps is certainly useful, but it is often too unsystematic to be of disciplinary value, because it does not begin with carefully selected simple forms, clearly isolated, and well defined, and advance gradually to forms of greater complication. The study of land forms on maps of actual regions should, indeed, always be preceded by the study of artificially simplified maps of type examples. The use of maps of actual land areas in their natural complication as a means of illustrating idealized types to beginners in physical geography is a good deal like the use of pages from the account books of a large mercantile establishment as a means of illustrating the simple processes of addition, subtraction, multiplication, and division to beginners in arithmetic.

It was with a view of providing a graded introductory series of ideal types that I included a number of simple, invented maps of imagined forms in my *Practical Exercises in Physical Geography* several years ago. However, for those who have not time or inclination for so systematic an approach to the subject, much can still be done by beginning with maps of actual regions. In the most elementary exercises suggested below, it is assumed that the student is advancing through the elementary stage in which acquaintance is made by some means or other with different kinds of land forms, and that he supplements his text book with exercises intended to give facility in reading maps on which selected kinds of forms are illustrated, in order that he may

later be proficient in describing actual landscapes. The more advanced exercises may be profitaby added to college courses.

The prevailing lack of proficiency in geographical description must impress every critical reader of articles upon exploration, such as appear in the leading geographical journals of the world. The authors of such articles, after traversing certain little known regions, naturally wish to give some account of them to others; and as one of the many readers thus addressed I have often made a faithful effort to visualize the landscapes described, but as a rule with small success. Part of the failure has doubtless been on my side, but the larger part is on the side of the authors, who for some reason or other omit various details that are essential to intelligibility. Perhaps the authors were less interested in the forms of the regions traversed than in the people who occupied them; perhaps they were interested enough in the land forms, but had never had adequate training in geographical descriptions; perhaps they were interested and trained in landscape description, but did not have assiduity enough to make written record while the facts were still before them: the result is the same, their descriptions do not suffice to portray the regions described to their readers. I believe that all three deficiencies may be lessened by preparatory exercises in the description of landscapes. The best preparatory exercises must be conducted out doors on carefully selected districts; but it is a very difficult matter to conduct such exercises as part of school work. It is with the object of suggesting similar exercises, based on topographic maps and adapted to the limitations of indoor teaching, that these pages are written.

Narrative Description

Let it be assumed that a chapter on "plains and plateaus" has been studied: the teacher may then place a map representing a characteristic part of the Atlantic coastal plain or the Appalachian plateau before each member of the class, and assign the following exercises: Select a route for a walk or a drive of a day or two across the quadrangle, and write a two, three, or four page account of what you would see. A teacher who has not yet made trial of such an exercise, will, I believe, be surprised at its useful and disciplinary possibilities. A simple description should suffice for young beginners, who need tell little more than directions, distances, heights, and local names; much more may be demanded from advanced students in a college course, who should give details concerning hill and valley forms, describe general views from hill tops, and introduce imagined personal experiences appropriate to the district traversed. The

composition thus produced evidently deserves consideration for its English as well as for its geography. The essence of its narrative form is that it presents the successive elements of the district traversed in the order in which they are encountered along the route that is followed. It thus serves as an introduction to the narrative record which a traveler might make in his journal, day after day, in his passage across an unknown country.

Narrative reports may vary not only in grade, as above intimated, but also in scale and in principle. Practice in writing on different scales, which corresponds to mapping on different scales, may be secured by requiring that the most important points of a three or four page report shall be reduced first to one page, and then to ten lines. This is of high practical value. It teaches a young writer how to tell the gist of his experiences, while excluding the less important details. Condensed narration must be well written, in order not to be dry; and nothing contributes so much toward the training needed in the preparation of a well written condensed report as practical exercises that result in producing it at the end of successive steps of approach.

Narrative reports may be varied in principle by specifying that some students shall avoid all explanatory terms and phrases such as account for valleys by erosion, for river directions by relation to initial land-slopes, for the location of villages by waterfalls or harbors, and so on; while other students shall use explanatory terms and phrases as far as possible. In other words, the first group is limited to the statement of visible matters of fact in empirical terms and phrases, from which all inferences as to past conditions, unseen processes, and supposed influences are ruled out; while the other group is urged to make use of pertinent theories in giving explanatory description to land forms and of reasonable inferences in accounting for the location of roads and villages, but it is at the same time cautioned to express any doubts that may be felt regarding inferences and explanations by some appropriate phrases, such as "it seems to be" or "it looks as if", and so on. In no other way can the contrasts between the empirical and the rational treatment of geographical problems be so well emphasized; in no other way can students be given so good ground for making choice between the two methods of treatment, one of which is so clearly an old fashioned, obsolescent method, that was unconsciously developed in an era when geographical facts were regarded as merely existing, while the other is as clearly a consciously planned, advancing method, by no means perfected as yet, but already characteristic of an era in which the evolutionary philosophy has

shown that geographical facts, like all other facts, are full of meaning, and that the discovery and announcement of their origin and development and meaning goes a long way in emphasizing their mere occurrence. Is it not plain, then, that with variations of grade, of scale, and of principle, narrative reports may give abundant and valuable exercise in geographical study?

Inductive Reports

Let it now be assumed that, after a few exercises in narrative reports on plains and plateaus have been performed, the class advances to the study of a chapter on mountains, concerning which a series of inductive reports are to be prepared. Here a number of maps from the Appalachian or other mountains should be brought forward; the various features, tographic as well as physiographic, represented on a quadrangle, are then to be grouped together according to their kinds, and their kinds are to be arranged or classified in some systematic order. Here again the reports may range from elementary to advanced, from condensed to detailed, from empirical to explanatory; but now, instead of travelling along a single route and presenting the facts there found in the accidental order of their encounter, it may be assumed that all the facts of an entire quadrangle, having become known by observation on many routes, are to be described in groups following some order that the young geographer may select or devise. Among the kinds or groups of things are ridges, valleys, streams, roads, villages; and these groups are not only to be separated from each other, they are also to be subdivided. Ridges may be subdivided according to height, length, direction or other features; streams, according to their direction, or to the relation of their direction to that of adjacent ridges; villages, according to their location on low ground or high, on streams or divides, and so on. It should be regarded as "fair play" to ask the teacher for needed information, not contained on the maps when it is needed in forming or in subdividing groups. For advanced classes, the topographic map may be supplemented by the other maps and the text of a geological folio.

The essence of this kind of a report is that it first brings things of a kind together, independent of the order in which they are discovered; it then arranges the various kinds of things according to some consistent plan; it next describes or defines each of the kinds according to some systematic method of geographical treatment; and it finally subdivides each kind into its varieties. While a narrative report corresponds to a traveller's story, such as geographical journals usually publish, an inductive re-

port corresponds to a text book. A narrative report describes each thing of whatever kind separately and for itself; an inductive report describes many things of a kind all together by generalizing them; that is, by selecting the essential features in which all the things of a kind agree, and omitting the individual features in which few or no things of a kind agree. Thus the idea of "type" is developed. True, this idea has been employed in the previous narrative reports, for everything then mentioned must have been named in terms of some previously acquired type, but at that time the idea of type was unconsciously accepted and employed, now it is consciously analyzed and developed. Definitions of groups or types framed by different students may be profitably compared; and when modified and improved by discussions, the definitions thus based upon the study of geographical features on maps may be advantageously compared with corresponding definitions in different text books; much wholesome discussion may be thus provoked; pupils may be even led to learn that a text-book is not necessarily final or infallible.

Furthermore, the principal of "classification" will be developed as the different members of unlike groups are subdivided. When classification is first attempted, it may be so little understood that valleys, for example, may be classed by placing all the long valleys in one category, all the wide valleys in a second, and all the deep valleys in a third, without perceiving that the features by which these categories are characterized are not mutually exclusive. The teacher may have to aid some pupils by explaining that the true idea of classification involves the separation of groups of things into subgroups according to the variation in the value of some feature that all the things possess. All valleys have lengths; hence valleys may be classified as long, medium, and short; all valleys, of whatever length, have breadth; hence all valleys, first grouped according to their length, may then be subdivided according to their breadth; and the three subdivisions thus formed may be again divided as to depth, making 27 subgroups or varieties in all. A very little of this sort of thing will be enough for beginners; for advanced students, there can hardly be too much of it if they wish to advance still farther.

However naturally a number of ridges or of valleys, or of roads, or of villages, may fall into groups and sub-groups and thus, as it were, assemble themselves around their ideal type, they will still show some individual variations and such variations are ordinarily indicated by the use of adjectives to qualify

the type noun. Care should be taken to select adjectives that best indicate the observed departures from type. In view of the variations of a group of things discovered on a single quadrangle, it is to be expected that a greater range of variations will be discovered when the field of observation is enlarged; and this will suggest that some adjectives should be held in reserve for future need. Here we encounter a process that may be called systematization, which I have treated at some length in an essay on the "Principles of Geographical Description" (Annals Assoc. Amer. Geogr., V, 1915, 61-105; see p. 77-85), but which cannot be considered here, farther than to indicate briefly that through this process the student may greatly enlarge his equipment with types and varieties of types—his "mental outfit" as it may be called—in preparation for future observational work. Suppose, for instance, that several cuestas, represented on different topographic maps, are reported for comparison; one may be low and narrow but well defined; another may be broader and higher, yet so much dissected as to be ill defined; one may be so flat-topped as to resemble a plateau; another so steep on both sides as almost to merit the name of ridge. As soon as these differences are apprehended, let the class be asked to imagine other values of the differences than those represented by the maps, to draw diagrams for their illustrations, and to select adjectives for their description.

Again, as further exercise in systematization, let all the elements of form in all these cuestas be searched out and defined, not as an abstract exercise, but as the most practical means yet invented for the quick observational detection and the accurate and intelligible description of any and every kind of cuesta, wherever and whenever met. Can anyone doubt that from a class whose mental outfit is thus enlarged, there will be a good chance for the emergence of a successful geographer!

Regional Description

A long step in advance of inductive treatment is made when regional description is attempted. Let it be supposed that the chapter on sea-coasts has now been reached in the text book, and that maps of a mountainous coast are selected for description. The effort here is not to set forth the features along a single route in narrative form, following the accidental linear order of encounter on a journey, nor to group the features inductively according to their kind, and arrange the various kinds of features according to some adopted system; but to present them all in their natural grouping in such a manner as shall give the best possible understanding of the region as a whole. The method

that will best accomplish this object is not yet agreed upon among geographers; there are presumably many "best" methods, each one to be preferred in view of special considerations. But it should be clear that, whatever method is best, it can be best reached by gradual approach through preliminary exercises on narrative and inductive reports; for regional description is the most difficult branch of geography, the goal of geographical endeavor.

Regional description, like the other forms of presentation already considered, may vary in grade, scale, and principle. Variations in grade will naturally accompany progress in geographical study through several years of increasing proficiency; variations of scale will be determined by the specifications of the teacher during school and college years, and by the exigencies of opportunity afterwards; variations in principle are not likely to be practised after a choice of principle has been made, for success in whatever principle is then adopted will demand devoted attention for it. Choice of principle should therefore be delayed long enough for it to be made intelligently, but not so long that no chance for later practice in applying it is allowed.

In the practical accomplishment of a regional description, its grade, scale, and principle having been decided upon, the chief difficulty lies in determining the order in which different features shall be mentioned; for although the object is areal, the means are linear; however many things occur together simultaneously in a given region, they must be mentioned one after the other. The systematic order of classification, approprite for inductive reports is not appropriate here; the first things to be mentioned should not be the easiest to understand or the simplest to describe, but the dominant features of the region, after which the subordinate elements should follow according to their relative importance. Evidently the inorganic features of land forms should precede all the organic features that occur upon them; and in a full description, such as is based on outdoor observation instead of on map study, climatic factors should be introduced between the land forms and their inhabitants; and the inhabitants should include plants and animals as well as man, and the correlations of all these factors should be clearly brought out; but exercises based on maps are limited to land forms and items of human culture, with the addition of plant assemblages such as forests and swamps when they are represented. Regional descriptions based on maps are therefore by no means complete, but they are valuable as introductions to more complete descriptions.

A few words may be allowed to emphasize the importance of exercises on different scales. Regional description is difficult under any conditions; but it is most difficult under the condition of limited space, when choice has to be made between what may be included and what must be omitted. Exercises on this topic should always proceed from detailed through medium to condensed statements. It is not to be expected that students should agree with one another as to the contents of condensed description, for agreement on so difficult a matter has not yet been reached even by professional geographers; but in any case, whether a condensed regional description is written by a tyro or by an expert, it will be better done if its limited contents have been carefully selected from an abundance of knowledge, than if they are hastily thrown together from a scanty store of information. Hence a full statement of facts should be written out first; and condensation should be progressive through two or three degrees. It is much easier to prepare a good condensed account in this gradual manner than in a single stride. Try it and see.

The evident difficulty that stands in the way of students gaining proficiency in geographical description through narrative, inductive, and regional exercises of different grades and scales and principles is the lack of time. There are, more is the pity, few schools or colleges in which geography is studied so seriously as to warrant the assignment of hours and years enough for this purpose; but I am convinced that if time can be found for some such exercises as are here outlined, the results gained will be repaying. Yet, as in all exercises, specified by one person and carried out by another, they will be almost worse than useless if they are in charge of a teacher little informed and less interested in geographical science. The enforced performance of these exercises under unfavorable conditions would be as dull and spiritless as their willing performance under favorable conditions may be lively and profitable.

There is an indirect advantage that will follow from map exercises, to which allusion has not yet been made: they will familiarize the youth of the nation with the value of good maps and thus make their value greater still. It was but a generation ago when, apart from the charts of the U. S. Coast Survey and from a few maps of specially surveyed areas, our people had practically no opportunity of knowing what a good map is. They saw the simplified maps of school atlases, the land-office outlines of western states, the rough state and county maps that serve the needs of commercial travellers, express companies and the like, and the caricatures that too often take the place of maps in railway folders, but they had no means of seeing topographic

maps on which the slopes of mountain sides, the breadth of valley bottoms, the fall of streams and many other facts are shown. Topographic maps for 40% of the area of the United States have been published in the last 35 years; many of the earlier sheets are deficient in accuracy, but all the later ones are excellent examples of topographic art; even the existence of these maps is unknown to vast numbers of our people. Surveyors, foresters, highway engineers, irrigation companies, and many other professional men use the maps abundantly and know their value; but few of them know that, at the present rate of progress in mapping, about a century will be needed to complete the topographic map of the United States. Progress is slower now than it was 30 years ago because better work is exacted. About half a million dollars has been spent on this work every year for ten years past, but if at that rate a hundred years will be needed to survey the whole country, it is plain that larger appropriations must be made in order to expedite the completion of the map.

Teachers who recognize the value of good topographic maps in their own work, and their technical value in many other directions may well take a hand in urging more rapid progress; and for this purpose the meetings of state branches of the National Council of Geography Teachers offer good opportunity for united action. But even with increased appropriations, scores of years must pass before the maps are completed, and in the meantime, the young pupils of today will grow up. Let us see to it that they grow up with a well founded understanding of what good maps are, and of their many uses in practical affairs. Then they will, in their turn, see to it that work upon the maps is continued and expedited.

Swine Feeding from Oak Forests in Spain

In western Spain certain lands covered with oaks are utilized by sending pigs into them to feed on the acorns. Toward the middle of autumn when the pastures begin to be poor and the acorns on the evergreen oaks which are earlier than the cork oaks, begin to ripen, the feeding begins. The process follows a certain order and is aided by knocking the acorns down with poles. The forest is usually divided into four parts and the acorns knocked from the trees in the low-lying quarter first; then the second after about two weeks, and so on. The pigs indicate their hunger for the acorns and the workmen do not begin until that time to knock them off.—[From the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases,* August, 1913.]

DEVELOPMENT OF AGRICULTURE IN THE PINE-BARRENS OF THE SOUTHEASTERN UNITED STATES

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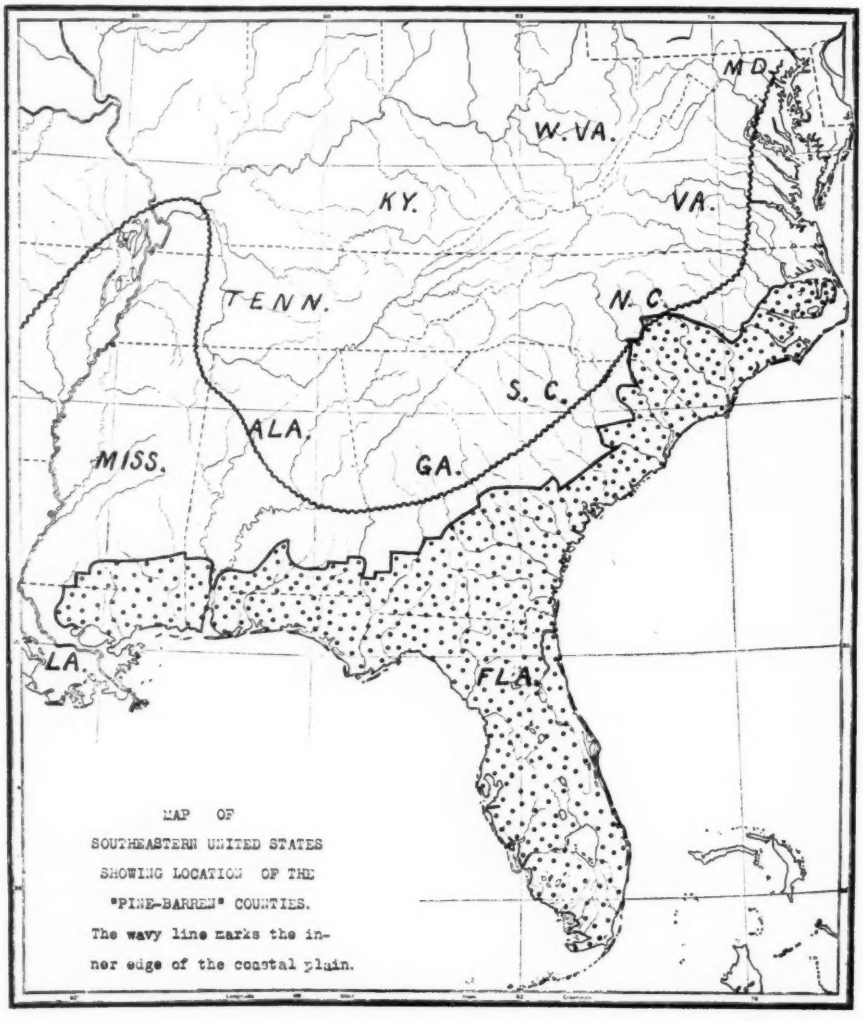
SOMETHING over half the area of the coastal plain of the southeastern United States (see accompanying map) is



MAP OF SOUTHEASTERN UNITED STATES SHOWING LOCATION OF THE "PINE-BARREN" COUNTIES. The wavy line marks the inner edge of the coastal plain.

known as the pine-barren region, and characterized by sandy soil and open forests of long-leaf pine, interspersed with swamps

of all sizes and varieties. Half a century ago this region was regarded as almost worthless for agricultural purposes. The population averaged less than ten inhabitants to the square mile, and the chief industries were lumbering, turpentining, and stock-raising. The lumber and turpentine came from the long-leaf pine (which is one of the world's most abundant and useful trees), and the wire-grass and other herbaceous undergrowth of the park-like forests, making up in quantity what it lacked in quality, furnished free pasturage for cattle. Cultivation of the soil was chiefly confined to the vicinity of rivers, to spots where a clay stratum approached the surface, and to the small areas that could be fertilized with the available stable manure; the cleared land made up considerably less than 10% of the total area. The swamps, which cover something like 10% of the area under consideration, also furnished some timber and pasturage, but little attempt was made to utilize them for agriculture.

Today economic conditions in the pine-barren country are quite different. The farmers there are boasting of the fertility of their land (and paying a higher price for it than for some of the naturally richer land farther inland), and the population and acreage of tilled land have trebled since 1860 and doubled since 1880; some individual counties having doubled their population in a single decade. Railroad mileage has increased even more rapidly, and new towns have sprung up almost like mushrooms. Swamps are being drained and cultivated, and many new reclamation projects are being agitated.

Between the middle of 1900 and the middle of 1915 there were three new counties created in North Carolina, three in South Carolina, fifteen in Georgia, five in Florida, one in Alabama, and four in Mississippi; and all but three or four out of the 31 are in the long-leaf pine country of the coastal plain. Numerous other evidences of prosperity and rapid development, which need not be enumerated here, can be plainly seen in that part of the country. At the same time somewhat similar developments have taken place in other parts of the world characterized by sandy soils and pine forests, such as the Cumberland Plateau of Alabama and Tennessee, southern Delaware, southwestern France, Holland, and northern Germany.

Meanwhile large areas of rich land in the South and elsewhere have been almost at a standstill, except where manufacturing developments have attracted population. There are many counties in the richer parts of all the southeastern states (also in

Illinois, Iowa, Missouri, etc.) that lost population between 1900 and 1910 or in some other recent decade. (See the Statistical Atlases of the U. S. Census). Some of the emigrants have doubtless gone farther west, but large numbers have simply moved to the sandy lands in their own states. This migration has naturally involved young white men more than any other class of people, with the result that the proportion of women, old men, and negroes has increased on the rich lands. In Alabama every county in the "black belt," the most fertile section of the state, has at the present time more women than men and many more negroes than whites.

The developments above outlined are illustrated statistically in the following table, computed from government census reports. The area of the states south of the Ohio River and east of the Mississippi is divided into two parts, one with relatively rich soil and the other with much sand and swamp. The boundary between them on the map is not the exact natural boundary (which is more or less indefinite anyway), but follows county boundaries, in order to simplify the statistical work. Although there are fertile spots below the line selected, and isolated areas of pine-barrens farther inland, none of these covers the whole of any one county, so that it is hardly worth while to make allowance for them in the statistics. Of course if these exceptions were taken into consideration the contrast between the two areas would be still greater.

The pine-barren counties, covering about 132,000 square miles, are indicated by shading on the map, and the rich lands considered here are the states of Virginia, Kentucky, Tennessee, and the unshaded portions of the Carolinas, Georgia, Alabama and Mississippi, about 284,000 square miles in all. In the table the rich lands and the pine-barrens are compared with each other and with the whole United States. The first three columns of figures give the number of inhabitants per square mile in 1860, 1880, and 1910; the next the percentage of increase between 1880 and 1910; the next three the percentage of the total area classed as "improved land in farms" in 1880 and 1910, and the percentage of increase, and the last two the number of acres of improved land per inhabitant in 1880 and 1910. (Statistics of the average value of farm land and total property values would show a similar trend, with perhaps even greater contrasts; but they would be less accurate, on account of the variable psychological factor involved in the conception of value).

	Density of Population				Percentage of Improved Land			Improved Land per Inhab.	
	1860	1880	1910	Increase 1880-1910	1880	1910	Increase	1880	1910
Rich lands...	25.1	34.5	50.5	46%	29.5	39.7	34%	5.5	5.0
Pine-barrens.	7.8	11.6	24.5	111%	6.4	12.8	99%	3.5	3.3
Whole U. S...	10.6	16.9	30.9	83%	15.0	25.1	68%	5.7	5.2

It will be seen at once that in density of population and in proportion of improved land, the rich soil area of the South is above the average for the whole country and the pine-barren region below, while the former is gaining more slowly than the whole and the latter more rapidly, so that conditions are tending to become more uniform throughout the country. The fact that the number of acres of improved land per inhabitant is less in the pine-barrens than elsewhere would seem at first to indicate a more intensive cultivation of the soil there; but another possible explanation is that in that region a considerable proportion of the inhabitants are still engaged in lumbering and other industries which do not involve tilling the soil, and import farm products from other regions. The slight decrease in the number of acres per inhabitant in all three regions in thirty years is doubtless correlated with the increasing efficiency of the farmers and the prevailing movement of population from country to city.

Few if any writers who have noticed the rapid development of the long-leaf pine country have mentioned what seems to be the principal cause of it. It is probably a common impression that the pressure of increasing population has simply forced farmers to the poorer lands, where by the exercise of thrift and care, by draining swamps, and by developing crops adapted to sandy soils, they have been able to make a living under somewhat adverse conditions. It has also been stated that some of the advantages of the sandy lands, such as salubrity, ease of communication by rail, abundance of artesian water, the ease with which the soil can be tilled in wet and dry weather, and scarcity of mud, dust, floods, droughts, and extreme cold, have not been fully appreciated until recently.

The abandonment of some of the rich uplands is commonly attributed to the Civil War, which liberated the slaves and upset the old plantation system generally, and at the same time allowed many clayey fields to be badly cut up by gullies during

four years of idleness. Washing and gullying have undoubtedly done great damage in some places, not only during the war but before and since, but there are large areas of rich land not much subject to erosion, such as the red hills of northern Florida and the more level parts of the black belt of Alabama and Mississippi, and the stagnation of population and preponderance of old people and negroes is almost as marked there as in the badly gullied areas.

The discovery of the cause of malaria, at the end of the 19th century, has tended to make alluvial areas more habitable, but in the pine lands proper malaria has never been an important factor. The relative increase of population in the pine lands of Georgia was considerably greater between 1890 and 1900 than between 1900 and 1910.

As the long-leaf pine is one of the most useful of trees, and is by far the most abundant tree in the pine-barrens, the increasing demand for its lumber and resinous products from the manufacturing communities of the North and treeless areas of the West has given employment to thousands of people, laid the foundations for many new towns, and brought wealth to numerous "captains of industry." This undoubtedly has been an important factor in the development of the region under consideration; but where the production of lumber and naval stores has declined with the exhaustion of the forests the population has usually continued to increase at about the same rate, and it is now much greater than could be supported by forest industries alone.

In those parts of the world that have passed the pioneer lumbering stage and have not reached the manufacturing stage, as is the case in the greater part of the South today, economic conditions are generally pretty closely correlated with soil fertility, or were so correlated before the use of commercial fertilizers became common; and in the development of the fertilizer industry seems to lie the key to the situation.

Sandy soils in humid regions, and swamp soils other than those of alluvial swamps, are well known to be deficient in available plant food, and no intensive permanent agriculture is possible on such soils without liberal fertilization. Of the several elements essential to plant growth, only three are commonly regarded as so liable to exhaustion that they must be applied artificially, namely, nitrogen, phosphorus, and potassium. Potassium is scarce in most coastal plain soils and especially in non-alluvial swamps, and nitrogen is scarce in nearly all sandy soils that have little humus. The average coastal plain soil is perhaps

as well supplied with phosphorus as the rest of the country is, but there are few soils that are not benefited by applications of that element after a few years of cropping.

The history of the fertilizer industry need not be gone into extensively here, but it may be said that the available supply of fertilizing materials of the kinds that were in use a century ago, such as stable manure, wood ashes, marl, gypsum, fish scrap, and bones, would be utterly inadequate for the amount of farming that is done in regions of poor soil today. The modern pine-barren farmer depends mainly on substances dug from the ground hundreds or thousands of miles from his fields, such as nitrate of soda, phosphate rock, and potash salts.

Previous to 1840, when Liebig published his epoch-making researches on agricultural chemistry, the use of fertilizers was very imperfectly understood, and besides there were hardly any railroads to transport these materials to points remote from navigable waters. And the discovery of some of the most valuable deposits of fertilizing materials came still later. By far the greatest known deposits of potash salts in the world are in Prussia, and these were not worked until the sixth decade of the last century. The mining of phosphate rock in the United States was begun in South Carolina about 1868, in Florida about 1888, and in Tennessee about 1893. Nitrate of soda, one of the most convenient sources of nitrogen, comes from Chile, and did not become a recognized article of commerce until about 1884. The use of all these substances in the pine country has grown by leaps and bounds.

No statistics of the use of each separate ingredient of fertilizers for areas smaller than states are available, but the government census reports give the total expenditure for fertilizers in each county for the year preceding the census year; and the ratio between that and the amount of land under cultivation, though varying considerably from year to year, is pretty constant for similar soils at any one period. The following table shows the amounts spent for fertilizers in the rich lands of the South, the pine-barrens, and the whole United States, per acre of improved land, per inhabitant, and per square mile of total area, in 1879 and 1909, in dollars and cents, and the percentage of increase in thirty years.

Expenditure for Fertilizers—	Per Acre			Per Inhabitant			Per Square Mile		
	1879	1909	Increase	1879	1909	Increase	1879	1909	Increase
Rich lands...	$0.20	$0.63	212%	$1.11	$3.17	286%	$38.19	$160.04	319%
Pine-barrens .	0.39	2.08	428%	1.39	6.95	400%	16.17	170.28	953%
Whole U. S...	0.10	0.24	140%	0.57	1.25	219%	9.63	38.33	302%

The increase in expenditure for fertilizers is of course not necessarily proportional to the increase in amount used, for the prices of different ingredients vary from time to time; but the table shows plainly that the increase has been far greater in the pine-barrens than in other parts of the country.

The use of fertilizer per square mile increased more than ten-fold in the pine-barrens in thirty years, and that section now uses more of it to the square mile than the more densely populated rich uplands. Some counties in Florida now have an annual expenditure for fertilizers of over $30 an acre, or over 100 times as much as in the country as a whole, and Florida, which is nearly all pine-barren and swamp country, has increased in population and agriculture at a faster rate than any other eastern state, as would be evident if statistics of this kind were given for separate states.

Just now, owing to the war in Europe, it is almost impossible to get potash, and the supply of nitrate and phosphate has been affected somewhat; but even if the European supply of potash should be permanently cut off (and even before the war began there were some threats of restricting its exportation from Germany), American ingenuity would probably come to the rescue with a successful process of extracting potassium salts from feldspar or kelp long before agriculture in the South reverted to the condition of fifty or even thirty years ago.

A PLEA FOR BETTER QUESTIONS

By Robert M. Brown
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IN looking over tests in geography given to the grades in several American cities, I was struck with the similarity of the questions for the different grades in the same school system. This was especially true in one case where a number of the questions for grade VI and for grade VIII might easily be interchanged.

All the questions for the VI grade are printed below, and in a parallel column the VIII grade questions which relate to the United States are inserted. Four of the VIII grade questions not given in the text had no counterpart in the VI grade list although two of the four were on a par with the question of the earlier grade.

GRADE VI	GRADE VIII
1. Name five States that border on the Great Lakes.	1. Beginning at the north, name in order, the States that border on the Mississippi River, on the east and on the west.
2. Name the States that border on Mexico.	2. Explain the Mammoth Cave.
3. Explain the Florida Keys.	3. Tell about the production of wheat.
4. Describe the method of raising rice.	4. Name a State that produces large quantities of rice; tobacco; Indian corn; copper; fruit.
5. Name a State in which each of the following products is obtained: copper; lumber; wheat; tobacco; sugar.	5. Name a special industry of each of the following places: Minneapolis; Pittsburg; Seattle; New Orleans; Boston.
6. Give an interesting fact about New Orleans; Minneapolis; Cleveland; Louisville; St. Louis.	

Teachers who have difficulty in realizing the stages of development which the subject of geography demands as the pupils proceed through the grades, may find some aid in *The Teaching of Geography* by B. C. Wallis (Cambridge University Press, 1915). Wallis applies the words, descriptive, transition, and argumentative, to the stages of teaching. He uses the first term (descriptive) to designate the key-note of the beginnings of instruction. This use of the term coincides in the main with the common use, but it should be clear that all geography is not descriptive and that other phases are presented in later grades. In our school system the curriculum of geography begins with home or observational geography; this is followed, after a study of peoples under different controls of living, by a brief survey of the world. Here ends in general the purely descriptive work and while it is not dropped entirely it no longer becomes the dominant aim. Wallis's second step, transition geography, has to do with investigations of geographic principles.

While the line between the transition and the argumentative stage is not definable it lies somewhere in the realm between the immature and the more mature mind. The work of the transition stage is a direct preparation for the later stage and may in general include the broader work of causes and effects and a knowledge of the conventional presentation of geographic information. In the United States this work generally includes the detailed study of the continents; but the extension of the transition stages over so long a time defeats the intent of the scheme. Many school geographies introduce a discussion of the Principles

of Geography between a study of North America and South America. This chapter, without doubt, Wallis would call an introduction to his transition stage and a subsequent study of South America, applying these principles to a particular realm for verification, would complete this stage. To continue this type of treatment for all continents seems a waste of time. The examiner of the VI and VIII grade pupils quoted above believes, apparently, that all geography is descriptive and that it has no other aim than the accumulation of facts and in this the examiner has many followers, blindly following, among the teachers.

Wallis calls his third stage argumentative geography which differs from the transition stage in intensity alone. The experience gained in the use of geographical principles and conventions is now utilized for a broad survey of the world. Here he would go beyond the scope of the ordinary text book and gleam materials for use from any trustworthy source as census reports, consular reports, newspaper summaries, atlases, and the like.

This division of the subject matter into phases or stages is pedantic and teachers would discover difficulties in the way if they attempted to carry out the program in detail; on the other hand the plan does furnish guide posts to the teacher's path and clearly emphasizes the progressive character of the work. Wallis emphasizes his theory further by selected examination questions arranged under headings as topography, maps, climate, etc. Under topography,* his questions for the descriptive are of this type.

1. Where and what are Niagara, Chile?
2. Into what sea does the Danube flow?
3. What natural feature forms the boundary between France and Spain?

Questions involving location are not bad questions; they are good questions but they should not become a habit with a teacher. The danger in this type of question lies in the tendency of the teacher to ask for information concerning relatively unimportant places and to encourage a gazetteer-like acquaintance with names. Under the transition phase, are questions of this type:

Sketch a map of South America. Insert three rivers; shade and name three mountain ranges. Insert and name three large ports. Insert and number one parallel and one meridian. Indicate the scale of the map, approximately.

This question as well as most of the questions under the transitional stage insists on an ability to use the conventional

*Wallis uses topography as a synonym for place-names.

symbols of the science and implies considerable training in this line. The type of question under the argumentative is not greatly different, but in the main it has an economic aspect:

Make a sketch map to indicate the routes of transport of wheat from Winnipeg to New York.

But Wallis is not consistent in the division of his questions under his three phases and his scheme seems to fail in the application. It is however only an apparent failure, a recognition of the fact that the progress from stage to stage is a gradual one and that the descriptive phase extends further through the grades in one division of the subject, as in the topographic, than it does in another, as in the study of manufacturing. There is always the danger in outlining a course after this manner that the mechanics become the real issue. In recommending this plan to teachers, it is hoped that if they have not a better plan, they will catch the idea of progressive teaching consistent with the increasing maturity of the pupils and that they will abandon the plan of cramming names and data through the course of geography in the grades. Before leaving Wallis's book, observe other examples in his questions. Under climate:

Descriptive. Are mountains wetter or drier than the neighboring low lands? Why?

Transition. Two places A and B have the following variations in temperature and rainfall.

Months.....		J	F	M	A	M	J	J	A	S	O	N	D
Temp. in degrees F	A	-4	-2	15	39	52	62	66	63	54	41	21	5
	B	52	53	55	59	65	71	71	79	74	67	59	54
Rain in inches...	A	1	1	1	2	2	3	3	3	2	2	1	1
	B	4	3	4	3	1	½	—	½	2	4	4	4

State the districts in which these places might be, giving reasons for your answer.

Argumentative. Compare the climate of the Mediterranean with that of the British Isles.

In the last case teachers may say that this is a common question in the schools, but the answer is not to be found in trite explanations as, hot, cold, wet or dry, but in such a thorough investigation of the climatic controls and variations of the two areas that the resulting differences in occupations, customs, vegetation and the like are evident. It is not a question to be answered off-hand from generalized climate zones but one to be investigated for the details of these zones.

The questions under the three phases for People and Occupations are somewhat similar, and unless the teacher realizes fully the desired progress of the pupils the questions may be answered in much the same words. Thus the descriptive question is—

Why are there so few people in the desert of Thar in the valley of the Indus, and so many people in Bengal in the valley of the Ganges?

The transition. Explain the difference in the density of population between Belgium and Russia.

The Argumentative,

Explain in detail why the population of the United States is roughly 14 times as dense as that of Canada; pointing out the circumstances in which these two countries are essentially similar and essentially different.

In all these cases I have chosen a question from a group and thus some injustice has been done. The entire list of questions supplied by Wallis is worth studying and stands as an index to his scheme of treatment.

In a recent book *How to Teach the Fundamental Subjects* by Kendall and Mirick (Boston 1915) there is a section on geography in which this matter of questions is discussed. The authors give a type examination in Geography in lieu of a long discussion in order to show the kind of thinking pupils ought to be able to do at the close of their geography work in the grades, and the kind of facts with which they ought to be familiar. The special feature of this test however is Part II, a list of questions to be answered by the use of the text books. This type of question or test is important. It is one of the aims in all of the branches—in geography, it has been called the atlas habit. Two questions of this list of five are printed:

1. Write a paragraph showing how the life of a boy or girl differs from your own in one of the following countries: (a) Japan, (b) England, (c) Cuba, (d) Russia, (e) India.

2. Compare Texas with Germany as to (a) size, (b) population, (c) industries, (d) wealth, (e) opportunities for education.

There are many such questions which arise as one reads papers and magazines and it is folly to expect that a geography course will equip the memory for all time. A little practice in the use of texts, atlases, readers, and other reference books will point out the way to the answers; the mental hazard will thus be easy but the physical hazard—laziness or love of ease—may still be difficult to overcome. In this book there may be found a discussion of the problem method of treatment, which it may be

well to add is not a new method but a rejuvenated one. The recrudescence of the problem is in itself a plea for better questions. Kendall and Myrick's criteria for a good problem in geography are: "it should be worth solving; it should be within the mental capacity of the pupil; and each one should be of such a kind that its solution will make the pupil more skillful or more intelligent in solving the next one."

The Course of Study, Baltimore County Schools (Baltimore 1915) indicates many types of problems for the grades and concludes the geography section by a discussion of the problem-study procedure. For a more definite working out of the problem the teacher is directed to *Practical Exercises in Geography* by Sanford and Sutherland (Boston 1915).

All these emphasize the thought-provoking question as an aim in upper grade work. It is likely that the teacher will not agree entirely with the points of view of any of the writers above quoted but she must at least concede that the weight placed upon the question is not exaggerated. The next step forward is not the adoption of any standardized method of procedure but the realization, within the limits of the personal equation, of the advancing stages of the subject through the grades. There is no better test of the assurance of this than the type of question used. Strayer* gives these tests for the teacher's questions:

1. Were my questions clear and concise?
2. Did they challenge the attention of all members of the class?
3. Did children need to think, to organize their experiences?
4. Was the sequence good?
5. Was it possible for every child to answer some of the questions?
6. Did each child have a chance to answer?
7. Did the children ask questions?

THE AIMS AND THE WORK OF THE NATIONAL COUNCIL OF GEOGRAPHY TEACHERS

By The Editor

NOW that the organization of the National Council is completed and state councils have been formed in more than half of the states, the question arises, "What is next to be done and how?"

From the beginning, the organizers of the movement have

*A *Brief Course in the Teaching Process*, p. 116.

believed and still believe that the most effective work will be done through the state organizations, assisted by local committees. The National Council will suggest lines of work and the JOURNAL will gladly report what various states and cities are doing, thus giving others the benefit of the experience of those who are accomplishing results.

It is hoped that local committees and state councils will not wait for suggestions from national officers. The United States is a large country and anything like a nation-wide campaign conducted by a single national committee would involve much time and expense. The best results will inevitably be secured by those local and state groups that make their own programs and carry them out.

A plan to build up a National Council of 1000 members is now under consideration. Each state will, under this plan, be assigned its proportionate representation in the National Council. The state organizations will then be asked to canvass the situation in their respective states and, after careful inquiry, to select the best qualified people to make up the representation for their states, and recommend them for the National Council. Persons who have already united with the national organization will be included in these state groups which make up the National Council.

The cost of carrying on a nation-wide correspondence or of mailing literature to all members of the national organization would be too great for the executive committee to assume. It will therefore be necessary for members to watch the pages of the JOURNAL OF GEOGRAPHY for notices, announcements, etc. The JOURNAL has been made the official organ of the Council and all members paying their annual dues of $1.00 are entitled to the magazine.

THE PROBLEM OF FINANCES

The National Council has been financed during the past year by a generous gift of $100 from the American Geographical Society of New York and by 10 per cent of the annual dues paid by each member, 90 cents going to the Journal of Geography for the magazine which each member receives. As membership in the Council grows, it is hoped that the JOURNAL can be supplied at a still lower rate, thus increasing the amount turned over to the National Council for its use.

Several of the states are financing their state councils by collecting annual dues of $1.25, retaining 25 cents for their own use.

If the state councils are to do effective work, they must have at least a small amount of money for necessary expenses. This

will probably have to be raised by securing as large a number of members as possible for the state organization, even though many of these persons do not at once unite with the national organization. Illinois, for example, enrolls members in the state council upon payment of 25 cents annual dues, and in both state and national councils upon payment of $1.25.

The Executive Committee feels confident that the state officers will find a way to raise the necessary money for carrying on their work.

Lines of Desirable Activity

(1) Nearly every state holds the annual meeting of its State Teachers Association in the fall. This is a favorable opportunity for getting the enthusiastic teachers of geography together and forming or strengthening the state organization. Each state leader should seize this opportunity for informing the teachers of his state regarding the renewed interest in geography teaching which is manifesting itself, and the organized effort that is being made to strengthen the position of geography in our educational system. Several states have arranged for Geography Round Tables at the State Teachers' Association meetings and several have provided for geography addresses on the general program or section programs. *Certain it is that geography will receive more attention at the teachers' associations this year than it has received in many a year.* This is due to the activity of a small group of devoted teachers in the various states.

(2) *Publicity* is necessary in any movement that seeks wide-spread support. A part of the machinery in every state should be a committee of ONE regularly to supply the educational papers and magazines of the state with news, notes, and occasional articles of a geographical character. Only thus can the great body of teachers be reached. This is a highly important phase of the work of the state organization. The selection of the right man or woman for this position is essential.

Local Geography Clubs and Societies

Every large city and many small cities should follow the example of Chicago, Philadelphia, Minneapolis, St. Paul, Cleveland, Richmond and several other cities which have permanent geographical clubs or geographical societies. In some of these cities membership is practically confined to teachers, while in others, Philadelphia and Chicago for example, business men, professional men, and others have become actively interested. Cleveland has made a feature of its Saturday classes and excursions. Chicago has a very excellent series of lectures each

year and also conducts field trips and excursions. In any city it may be taken for granted that at least one person in every thousand of the population can be counted upon actively to support a local geographical society if good leadership is available.

The Ultimate Aims

The building up of an organization, the securing of speakers for local and state associations, the increase of geographical articles in educational magazines and the enlisting of larger public interest in the subject of geography are mainly means to certain ends. One of these is the leading of school boards and superintendents to ask for teachers who have made adequate preparation for teaching geography. This will lead Normal Schools to give something like proper training in geography to teachers who go out to teach it. The Normal Schools are perfectly willing to provide the kind of teachers that the market demands. If teachers who can teach geography effectively are demanded, the training schools will soon take steps to meet the demand.

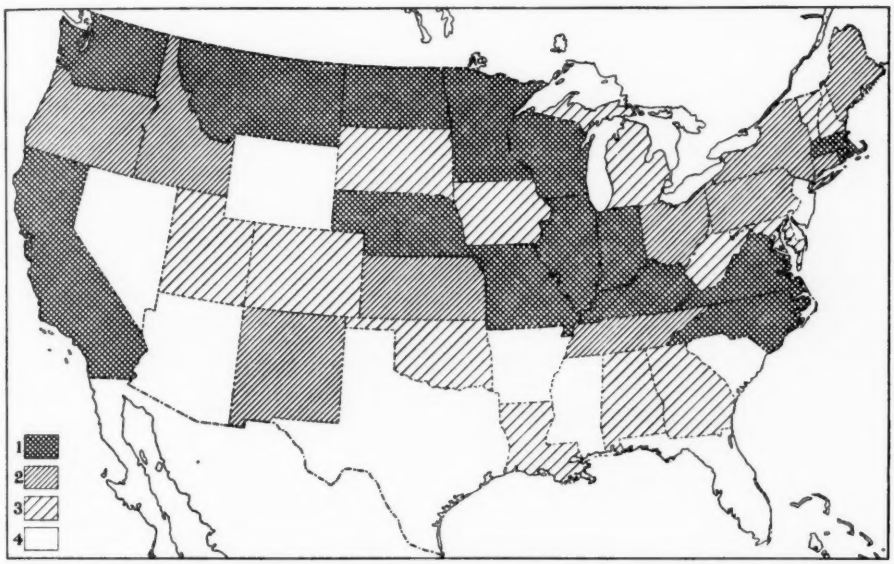
Another aim is to secure larger opportunities for prospective teachers to study geography in the colleges and universities. Fortunately, a most notable growth of geography is now going on in the higher institutions. At least two Middle Western universities enrolled more than 1000 students each in geography courses last year.

A third aim is to put renewed life and enthusiasm into the geography teachers that are now engaged in the work. The teacher and the spirit which she puts into her teaching are everything. If a wave of interest in geography is caused to spread over this country, thousands of teachers will catch the enthusiasm.

A fourth aim must be the continued careful study of the pedagogy of geography, the thoughtful framing of courses of study by committees of experts and the securing of better and better maps from our map publishers, and better and better books from our book publishers.

Already notable progress in this line is making. We are getting better maps and our school text books are the best in the world. The German and French elementary books are behind ours and the English school geographies are decidedly inferior to our best.

These are some of the lines of activity ahead of us and these are some of our aims. And now let us go to it!



PROGRESS IN ORGANIZATION OF STATE ASSOCIATIONS OF GEOGRAPHY TEACHERS DURING 1915.

1. State organization completed (Ohio and Kansas have been added since the map was prepared).
2. State organization will probably be completed in 1916.
3. Leaders have been appointed.
4. No leader secured to date.

The officers of the National Council chosen for the year 1916 are as follows: President, Richard E. Dodge, Teachers College, New York City; First Vice-President, Albert P. Brigham, Colgate University, Hamilton, N. Y.; Second Vice-President, Charles R. Dryer, Fort Wayne, Ind.: Secretary and Chairman of the Executive Committee, George J. Miller, State Normal School, Mankato, Minn.; Treasurer, Vernor C. Finch, University of Wisconsin, Madison, Wis.

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THE SALT MINES OF AUSTRIA

By Emily A. Budd
Training School, Richland Center, Wis.

SITUATION. The salt mines of Austria, which lie mainly in the Carpathian Mountains, furnish a little less than five per cent of the world's output of salt. As one author states, the annual production of salt from Austria is enough to build a sidewalk from Boston to San Francisco, six feet wide and six inches thick. The mines are a monopoly of the government, and one of the principal sources of income for the country.

Occurrence. In many places there once existed salt lakes or arms of the sea, whose waters in the process of time have disappeared, leaving the salt. Changes in the crust of the earth have buried these deposits under deep beds of sedimentary rock, and rock salt as hard as coal has been formed.

Mines and Methods of Mining. The usual way of obtaining salt in this country is from brine wells. A well is bored down into the deposit. Water is forced down to dissolve the salt and this brine is forced to the surface, evaporated by the sun or artificial heat, leaving the salt crystalls. In the most up to date mines a double tube pipe is used, the fresh water going down in one while the brine is pumped up through the other. Sometimes salt is obtained from natural brine springs. A third method is by mining.

Wieliczka Mines of Austria. A few miles from Cracow is a little town, Wieliczka, which is built on the roofs of the great salt mines beneath. These salt mines are the most wonderful in the

world. To descend into these mines one may go by means of a great staircase carved out of solid salt or by means of an elevator. This mine has been quarried into chambers that lie in seven stories, one above the other. Each chamber is connected by horizontal passageways and the stories by winding stairs.

One gallery opens into a splendid ball room, three hundred feet long, ninety feet high with ceiling, pillars and chandeliers all of sparkling, glistening salt. Statues of Vulcan, Neptune, and other mythological persons adorn the room. At one end a rude throne has been constructed, for the use of the Emperor, should he ever honor any of the festivities with his presence. One ball room has been used for social functions since 1814.

Chapel of St. Anthony of Padua. Near the ballroom is the Chapel of St. Anthony of Padua. This was hewn out of solid rock salt. The great organ, the high altar with its crucifix, its twisted pillars and statues of the saints are carved of pure glistening white salt. In former years mass was celebrated every morning but now it is held only on July 3 of each year.

Underground Railway Station. In the third story of the mine is a railroad station and an excellent restaurant. Twenty-five miles of railroad lines from all parts of the mine center here. The restaurant is kept open all summer for the benefit of tourists; four hundred guests may be seated at one time at the dining tables.

The Dead Sea. Seven hundred feet below the surface of the ground is a great salt lake. One of the most thrilling adventures for the tourist is to ride over the thick dark waters in a boat which is guided through the various caverns by ropes and pulleys.

Kaiser Franz Chamber. This room is two hundred feet long and it contains two immense pyramids carved and ornamented in honor of a visit of the emperor and empress.

Export. Austria has many other salt mines and brine wells. The deposits of salt are said to be inexhaustible. In 1905 Austria produced 609,572 short tons of salt. In one of the mines a plant has been installed for the making of salt briquettes. The moisture is pressed out so that only about one per cent remains. These are made chiefly for export to tropical countries.

THE AUSTRALIAN BARRIER REEF

THE Great Barrier Reef of Australia is one of the wonders of the ocean world. Its marvelous structure and extent were first brought into prominent notice by the famous explorations of Captain Cook. Imagine a broken line of beautifully colored

coral formations extending for 1250 miles, and varying in width from 5 to 75 miles. Picture, if you can, a field of wonderfully shaped corals, growing in great profusion and confusion. Extend this field for miles and miles, as far as the eye can see and beyond. Place in your picture hundreds of coral-bound bays and lagoons, each with birds of gorgeous plumage hovering about and above them. Add a tropical climate, and you will have created, in a meagre fashion, a view such as you would see should you visit the Great Barrier Reef of Australia.

The reef skirts the northeastern coast of the continent, and is separated from the mainland by an expanse of shallow water averaging 30 miles in width. In position, it corresponds to the barrier beaches off the eastern coast of the United States, but unlike the monotinous sand-dunes of the barrier beaches, the barrier reef is full of variety. Its irregularities are due to innumerable openings and channels. The outer edge of the reef is really a chain of detached reefs of variable lengths, only a few of the passages between which are of sufficient depth for ocean vessels. The British government has charted the navigable passages and they are now used very extensively.

The enclosed waters between the outer edge of the Barrier Reef and the mainland represent an expanse of 80,000 square miles. The entire area is really an archipelago of detached reefs and coral islets, the majority of which are completely submerged or only partially exposed to view at ordinary low water. The linear chain of reefs, together with the inumerable secondary reefs, constitute a natural breakwater, making of this area a tranquil inland sea which the largest ocean steamers traverse. Due to the intricateness of the passages, however, a large staff of efficient pilots is necessary to guide the ships. As a further precaution against danger in navigation, an excellent system of lighting and beaconing has been established by the Queenland government.

This most colossal of all coral formations was built up by tiny soft-fleshed polyps of multitudinous forms and colors. Darwin established the theory that a subsidence is necessary to produce the reefs, and that the coral formations are built up from the higher submerged elevations that fringe the mainland. This hypothesis is supported by most explorers and investigators, and all are now pretty well agreed that the great reef came into existence in that manner.

C. E. GRANGER.

AN EXPERIMENT IN CORRELATION

By V. C. Bell
Harrison Technical H. S., Chicago

ABOUT two years ago it occurred to a few of the teachers of commercial subjects at the Harrison Technical High School (Chicago) that it might be possible to work out a successful and profitable scheme by means of which the work in at least a few of the commercial subjects could be correlated. We feel that we not only succeeded in correlating commercial geography, commercial English, and typewriting primarily, but, incidentally, commercial art, stenography, and library study.

We are fortunate in having a branch of the Chicago Public Library in our school building and so we have an advantage over many others in reference work and supervised library work. The scheme is as follows:

1. The commercial geography department furnishes the subjects for discussion and the work begins there.

2. During the first semester, after a thorough study of some one product the instructor assigns to each member of the class both a topic to be written up and a graphic exercise; these are chosen from an outline which is worked out in class. This outline is then sent to the teacher of commercial English that he may know what is expected in the way of a discussion.

3. Each class works up a different subject each semester.

4. After the topics have been assigned a reading list is posted, and a note sent to the librarian stating the subjects on which references will be needed. She is then in a position more materially to assist the student when he comes for references. Commercial geography is a sophomore subject according to our course of study, but many sophomores are unable fruitfully to use either an index or a table of contents; hence a word or two of advice from the librarian saves much waste of time and energy, in addition to teaching the proper use of a reference book.

5. After the reading has been done and the notes taken, the English teacher assists in outlining the individual topics, and the resulting composition becomes a "chapter" in the "book" which the class thus writes on the product.

6. The compositions are first graded by the teacher of commercial geography—for geographic facts only; it is then sent to the teacher of commercial English, and finally to the typewriting teacher—each in his turn grading the paper, the three grades appearing on the first sheet of each "chapter" in a space prepared for the grades.

7. The papers finally return to the commercial geography department where a table of contents and an index are prepared, and the "book" goes into the list of reference books and display work of the department.

8. The cover of the "book" is drawn by a student from the commercial art classes, by one of the students of the class writing the "book", if possible.

9. When a student has finished his typewriting manual the teacher of typewriting sends to the commercial geography department for extra work for the student; in this manner we make typed copies of magazine articles, and file them for class use; we are also able thus to put into the hands of all the students at once clippings which would otherwise be available to only one at a time.

10. The stenography teacher uses assigned magazine articles on commercial geography subjects as dictation material; the wild scramble for the one library copy of the article is thus avoided, as the typed copy is handed in to the stenography teacher by each student in her class, and then comes to the commercial geography department.

11. During the second semester a second "book" on some nation is similarly worked up.

We feel that quite a little improvement in all lines of work correlated has come from this scheme, and that results justify the work.

PERU—ITS PRODUCTS AND POSSIBILITIES

ONE not thoroughly familiar with the geography of the West Coast of South America has a series of surprises in store for him. In the first place, strange as it may seem, the coldest day of our trip South, after leaving the coast of the Carolinas, was that crossing the equator. Instead of bright, balmy tropical weather, the skies were usually overclouded and the air cool and snappy all the way down the 1,000 miles of Peru's long coast line, though it lies wholly within the tropics. This is due to the effect of the Humboldt current, a great Antarctic stream which follows the coast northward to a point above the Equator and is comparable with the Gulf Stream of the Atlantic in its far-reaching effect on climatic conditions, though the effect of the Humboldt current is just the reverse of that of the Gulf Stream. It is this feature of Peru's climate which explains the common expression that Peru is a "white man's country," for while geographically it is tropical, climatically it is a temperate country.

But this cold ocean current is at the same time a curse to the

country, in that it prevents any rainfall from the Pacific breezes, the land being warmer than the water, while the high wall of the Andes prevents the rain-laden winds from the Atlantic reaching the West Coast. People along this coast speak of a rainfall fifteen or twenty years ago as one might speak of an earthquake in New York.

As a result of this we have a vast strip of land between the ocean and the coastal range, about two thousand miles long, including both Peruvian and Chilean territory, and from fifty to a hundred miles wide, which in climate, in fertility of the soil, and in other respects, is the equal of the narrow strip of our own country bordering the Pacific—except for lack of water. "Water, water," is the great cry of the sparse population that is found in this region. Every available stream that trickles down from the snow-capped mountains is husbanded, and when turned upon the land renders it a veritable oasis.

On the slow coasting steamers that ply from port to port, it will take one ten days to make the journey along Peru's extended coast. The ten or a dozen small ports, besides Callao, at which steamers stop, invariably mark the mouth of some small river which waters a fertile valley behind, but as often as not the water will all have been used in irrigation before reaching the ocean's edge or will have disappeared in the porous sands several miles inland. It is on the oases produced by these rivers, dotted along the great coastal desert, that Peru grows practically all of her agricultural products, her sugar, her cotton, rice, fruits, etc., and it is here that her cattle are grazed. Of the agricultural products sugar is now king, although, in normal times, cotton is a close rival.

The Cerro de Pasco Mining Company, a large American enterprise, is at work up on the high plateau, at an altitude of 14,000 feet, and is accomplishing marvels in the mining of copper. It has meant, however, the investment of millions of dollars of capital, the building of railroads, the opening of coal fields, and the development of the copper mines on a gigantic scale, to say nothing of waiting fifteen long years for any returns. But now this concern is producing 75 per cent of the copper exported, and, aided by the present unparalleled prices of this metal, is entering upon a stage of well-merited prosperity. Peru's annual production of copper is now over $10,000,000.

Outside of its minerals, the cane sugar industry of Peru has been the basis of much of the country's wealth, and has been the chief hope of forward-looking Peruvians. For Peru's sugar land surpasses all other sugar producing countries, except Hawaii, in the acreage yield of sugar.—[Excerpted from *The Americas* for June.]

THE SUEZ CANAL

By Genivera Loft

University of Wisconsin, Madison

THE construction of the famous "ditch in sand" known as the Suez Canal marked a triumph of diplomacy rather than of engineering skill. Before its promoter, Ferdinand de Lesseps, could have the work of excavation started he had to secure the consent of the Viceroy of Egypt, and this had to be given against the wishes of the Egyptian people. In addition he had to overcome the obstacles placed in his way by the British and had to persuade prospective stockholders that the accounts of difficulties existing in the canal zone were unfounded.

The work of digging the Suez Canal began in 1859 and was completed in 1869. Nearly all of the material to be removed was soft, and the line of the canal extended through an extremely flat region; excavation was, therefore, not a difficult matter. Under the original agreement the Egyptian government was to supply 80% of the labor. This led to a system of forced employment, and when about one third of the work was completed the Viceroy interfered and the use of forced labor was abolished. This was a very fortunate occurrence for the canal company since it led to the introduction of power dredges and other machinery, and hastened the work greatly. Previous to this the material had been scooped by hand into the baskets in which it was carried away. The total cost of construction was about $100,000,000, or $1,000,000 per mile.

The canal had a width of 328 feet at the water line and 190 feet at the base and has an average depth of 26 feet. Since there is no appreciable difference between the levels of the two bodies of water which it connects, there are no locks. It has been widened and deepened since it was first constructed so that now ships may pass at any point.

In 1887 electric lights were installed so that ships might use the canal at night. Retaining walls have been built in some places and it is planned to have them along the entire length of the canal. So unstable are the sandy banks that vessels have to reduce their speed greatly in order to prevent the sides from being washed away.

There are no slides to interfere with the passage of vessels but the wind carries so much sand into the channel that dredges are at work constantly to prevent its being filled. From 14 to 18 hours are required for the passage through the 100 miles of the canal.

Use of the Canal

The canal was opened at about the time that sailing vessels were being generally replaced by steam ships. The great saving in distance which it effected caused it to be used by the large vessels and resulted in a decline in the use of sailing ships. It reduces the distance from England to Bombay over 6,000 miles, and the distance from New York to Bombay 2,500 miles.

During the first years in which the canal was used it did not pay expenses but by 1876 it was being used by over 1400 vessels. At the present time, under normal conditions, about 10 vessels per day pass through it, and two-thirds of them are British owned. Of the separate lines the Peninsular and Oriental is the largest user.

Control of the Canal

In 1875, through the strategy of Disraeli, the majority of the shares of the canal company passed from the hands of the Viceroy of Egypt into the control of British capitalists. This has led to the extension of British authority in Egypt so that it is now virtually a part of the British Empire. In 1888 the neutrality of the canal was guaranteed. England does not police the zone nor does she possess any privileges not enjoyed by other countries, and there are no preferential tolls for British ships.

The greatest benefit which the canal has given Great Britain is the connection which it affords with India. Together with Gibraltar, Malta and Aden, it enables Britain to dominate the Suez-Mediterranean route. This route offers an outlet for the products of India and allows her to enjoy the benefits of the railroads and other improvements which have resulted from the British regime. As a result of the improvement in communication between England and India the influence of England is more effective and the bond between the two has been greatly strengthened. The importance of the canal to Indian commerce is shown by the fact that about 50% of the traffic is accounted for by that country.

It is evident that it is a matter of great importance to England that the control of the canal shall not pass into the hands of her enemies. It is not because her ships enjoy special privileges that Great Britain must continue to dominate the situation but it is necessary that she hold the canal to prevent interference with her trade in times such as the present.

By strengthening the commercial ties between the Occident and the Orient the Suez Canal has benefitted practically all na-

tions. It has been to the advantage of all interested in the canal that it has been, since 1875, under the control of a nation whose power is so respected that no disturbance or interference with shipping have been possible.

CURRENT MATERIAL FOR THE GEOGRAPHY TEACHER

The Sahara in 1915

The exploration of the Sahara has been carried on, mainly by the French, with persistent energy during recent years. At the same time European control, not only of the Sahara itself but of the surrounding regions, is causing many changes in the social and economic conditions of the desert. . . .

The old notion of the Sahara as a boundless waste of shifting sand—a dried-up ocean-bed below the level of the sea—persists in many minds, and is fostered by tourists whose only knowledge of the desert has been gained by a visit to Biskra. This notion owed its rise to very natural causes. Approached from Egypt or the Barbary States, the only directions from which it was approached by civilized man until recent times, the Sahara does present almost everywhere a waste of sand, and much of it shifting sand. . . .

The size of the Sahara is indeed hardly realized. It covers approximately 3,500,000 square miles and is not much inferior in area to the continent of Europe. Though sand extends over probably 700,000 square miles, rocky plateaus and not sand-dunes are the chief characteristics of the desert. If a generalization be attempted, the Sahara may be described as a great table-land scored by the beds of dried-up rivers, diversified by mountains and depressions, and fringed by a deep belt of sand west, north, and east. . . . The higher plateaux and the mountain ranges occupy a central position and extend across the Sahara northwest to southeast. This elevated region is sometimes spoken of as the bridge connecting the Mediterranean lands with Central Africa, the means by which early man spanned the desert. . . .

In the central Sahara there is comparatively little sand . . . and somewhat more favourable conditions prevail in parts of the plateaux and mountains of this region. Between the granitic and sandstone hills, are wooded hollows and extensive pasture lands, and though there are no perennial rivers, the watercourses are filled during the rainy season (August to October). . . .

Though water is—for the Sahara—plentiful, and portions of the southwestern Sahara support large herds of cattle, sheep, and goats, there are no permanent streams. . . . The hinterland of the region between Cape Bojador and the Wad Draa . . . is also tableland, and is probably better provided with pasture than the uplands farther south. It is the home of the great raiders of the western Sahara.

. . . The Moroccan Sahara is taken to be the country south of the High Atlas; . . . it is a land of promise as it contains three rivers which are never completely dry. These rivers, as they descend from the High Atlas, turn south-west and make for the Atlantic, though of the three only the Draa reaches the sea. . . . —[From the *Geographical Journal*, Nov., 1915.]

Prosperous Year for Mines of the United States

The midyear review of mining conditions reported to the Secretary of the Interior on July 1 by the Director of the United States Geological Survey is well supported by the preliminary reports for the year submitted Jan. 1. The Geological Survey is making public its usual estimate of mineral production for 1915 in the form of a separate statement for each of the more important mineral products.

A review of these statements confirms Secretary Lane's comment of last July to the effect that the mining revival is in full swing. In the Western States alone the metal production shows an increase in value of more than $130,000,000 over the corresponding figures for 1914; and the year's increase in output for the principal metals measured in value is more than $250,000,000. Moreover it is not unreasonable to expect that when the full returns for all mineral products are compiled they will show that 1915 was the country's most productive year in the mining industry. The total may even reach two and one-half billion dollars.

The copper mines passed all records for previous years, the 1915 output having a value of $236,000,000, or $83,000,000 more than the value of the production for 1914. Only twice in the history of copper mining has there been a larger increase in quantity of metal produced.

The total shipments of *iron ore* from the mines in the United States in 1915 are estimated to have exceeded 55,000,000 gross tons, an increase over 1914 of more than 38 per cent. The increase in *pig iron* is estimated at 6,500,000 tons, with a total increase in value of pig iron production of more than $120,000,000.

The output of zinc (spelter) made from domestic ores was larger than ever before, being worth $120,000,000 as compared with $85,000,000 in 1914.

The production of *bituminous coal* and *anthracite* in 1915 is estimated to have increased between 4 and 5 million short tons, or less than 1 per cent. The quantity of bituminous coal mined increased about 6½ million tons and that of anthracite decreased over 2 million short tons.

Preliminary estimates of the total output of *petroleum* in the United States in 1915 indicate a slight increase over the corresponding output in 1914. It is believed that the total petroleum yield of the United States in 1915 amounted to 291,400,000 barrels.

The estimate of *Portland cement* output in 1915 indicates shipments from the mills of 86,524,500 barrels, an increase of one-tenth of one per cent over 1914.

Perhaps the most notable item in the year's record is the stimulation of metal mining in the Western States. Almost without exception the increases in production were large and in several States 1915 was the best year on record. In Arizona, which leads in copper, the output of that metal exceeded the previous record production of 1913. California continues to lead in gold and had the largest yield in 32 years, and with one exception in half a century. In Montana and Arizona record outputs of silver are reported and in Alaska the increased production of gold and especially copper made 1915 a much more prosperous year than even 1906 when Fairbanks and Nome were yielding their greatest returns of gold from bonanza placers.—[*Bulletin U. S. Geol. Survey.*]

Resources of Wyoming

Wyoming is a State of large resources, whose development has only begun. Within its 97,594 square miles lie the most extensive coal and oil fields of the Rocky Mountains, thousands of acres of irrigated and dry-farming lands, and extensive areas of splendid stock range; moreover, some of the finest fishing and hunting in the United States can be found within its borders. Although the precipitation averages only 12½ inches a year, the many irrigated areas are highly productive, and the success which dry farming has here and there attained seems to indicate that a still larger area may be brought under cultivation of that kind.

Among the mineral products of the State coal is preeminent. Its coal fields cover about 41,500 square miles—two-fifths of the State's area—and contained originally an estimated 670,723,-

000,000 tons. Of this quantity only 178,000,000 tons, or about one-fortieth of 1 per cent, has been exhausted. The production in 1913 was 7,393,066 tons, valued at $11,510,045.

The second in value of production among the mineral resources is oil, of which 2,406,522 barrels, valued at $1,187,232, was produced in 1913. The production in 1914 amounted to about 4,600,000 barrels, equal to more than 60 per cent of the production of Pennsylvania for the same year, and places Wyoming, whose oil fields are newly discovered and only partly developed, in the ninth place among the oil-producing States of the Union.

Other minerals, including gold, copper, iron, gypsum, limestone, sandstone, marble, brick, clay, and mineral waters, brought the value of the State's mineral production in 1913 up to $13,682,091. Among the undeveloped resources are bituminous shale, volcanic ash, graphite, asphaltum, manganese ores, bentonite, tin, salt, bismuth, and perhaps most important, phosphate rock, on which the future of American agriculture may largely depend. It is estimated that more than 1,250,000 acres in Wyoming are underlain by workable phosphate deposits, a phosphate area greater than that of any other State. (Overland Guidebook, Bulletin 612, U. S. Geological Survey.)

A Sample

Editor of the Journal of Geography:

I wonder if the Journal might be interested in some of the answers given by applicants for *licenses* to teach in the state of ——— to the question, "*Why does latitude influence temperature?*" The following are given verbatim:

"The latitude influences the temperature because the wind which blows from the north brings down a cool current and a wind which blows from the south carries a warm current so the state that lies in a latitude direction is warmer than one that lies in a longitude direction."

"Latitude has an influence on temperature because of the distance of the earth from the sun and some countries in the same latitude are in different zones."

"Latitude does not influence climate, they are lines which have been drawn to locate places."

"Latitude influences climate because the trade winds blow in from the ocean and the farther north one travels the stronger he will find the winds."

"Latitude is from east to west and as you near the equator the air becomes warmer."

"Latitude divides the world into zones and each zone has a different temperature."

In about two hundred and fifty papers I think I found only three which stated that the latitude influenced the length of day and night and the angle of the sun's rays.

Yours truly,

And these are the answers of candidates for licenses to *teach* geography. —*Editor.*

Young America's Need of Geography

An inquiry by the National Foreign Trade Council shows that many concerns engaged in foreign trade fill positions with foreigners when they would prefer young Americans if young Americans were available. They are not, because, for one thing, young Americans are not much tempted by foreign trade. That generally involves residence abroad, and they would rather reside here. Probably the young Pennsylvanian is sufficiently adventurous to be tempted by a job in Oregon, and the young Oregonian would find an opening in Pennsylvania attractive; but Argentina leaves both of them cold.

Another obstacle is general lack of any training for a foreign post. High school or college may have bestowed a smattering of French, German or Spanish; but commonly it is a very sparse, unserviceable sort of smattering. General ignorance of geography is conspicuously mentioned in the report. High school or college may have left an indefinite impression that Argentina is an extensive country in South America, but there is virtually nothing in the young American's mind that enables him to imagine Argentina as he can imagine Oregon or Pennsylvania. It is mostly just a misty void to him; and misty voids are not attractive.

Now if the young American had some real knowledge of the language of the country, and some real knowledge of the country itself, his imagination would take hold of it. Often, without doubt, the adventure would tempt him. It all comes back to a pretty complete lack of training for any foreign field. If we are to cut a far greater figure in foreign trade, young Americans finally must be able to imagine foreign countries to a greater degree than they do now. Teaching of foreign languages and geography should be got out of the smattering states.—[Editorial *Saturday Eve. Post.*]

Copper Production

In the following table the production for 1915 is apportioned to the States in which the copper was mined.

Production of copper in the ten leading states in 1914 and 1915.

(Smelter output, in pounds fine.)

	1914	1915
Arizona	382,449,922	432,467,690
Montana	236,805,845	268,263,040
Michigan	158,009,748	238,956,410
Utah	160,589,660	175,177,695
Alaska	24,985,847	70,695,286
Nevada	60,122,904	67,757,322
New Mexico	64,204,703	62,817,234
California	29,784,173	37,658,444
Tennessee	18,661,112	18,205,308
Colorado	7,316,066	7,272,178
Total for United States	1,150,137,192	1,388,009,527

NEWS NOTES

Miss Mabel Stark, chairman of the Illinois Council of Geography Teachers, added 50 new members to the Illinois Council from among the teachers at the summer session of the Normal University at Normal. Twenty-five of these also enrolled in the National Council. Added to the enrollment which Miss Stark had previously secured, it is probable that Illinois is now nearly if not quite the leading state. She has arranged for the publication of a 4-page leaflet each month "to disseminate geographic notions, council announcements, etc., throughout the state." The first of the leaflets will be a resume of the national and state councils: the past, the present and the future of the Illinois council.

The Editor of the Journal is scheduled for addresses on Geography before the state teachers associations of Massachusetts, Nebraska, Kansas, Minnesota and Wisconsin, during November.

Announcement is made of the organization of a new map publishing company known as the Denoyer-Geppert Co., of Chicago. Both men were formerly in the service of A. J. Nystrom

and Co., map publishers, Chicago. Mr. Denoyer was earlier in charge of the department of geography of the La Crosse, Wis., Normal School.

Miss Zonia Baber of the department of Geography, School of Education, Chicago University, has an article on "The Ocean; Our Future Pastures" in the September *Scientific Monthly*.

Mr. Stephen S. Visher of the Moorehead, Minn., Normal School has an illustrated article on "The Biogeography of the Northern Great Plains" in the August number of the *Geographical Review*.

RECENT PUBLICATIONS

THE ORIGIN OF THE EARTH. By Thomas Chrowder Chamberlin. The University of Chicago Press, Chicago, 1916. xi+262 pp.

This book is a contribution to the University of Chicago Science Series. It is written "not only for the specialist but for the educated layman." The highly philosophical subject is treated without great modification of Prof. Chamberlain's usually rather difficult style. It is certainly not the type of popular science book the principles of which one may expect to assimilate at one sitting.

The principles set forth have mainly been presented in certain chapters in the author's text-books of geology and in technical articles. They are here re-presented together with the incidents which led to their formulation. The book is the story of the "search for the mode by which the earth came into being." The discussion begins with the relation of the nature and physical behavior of gases to theories of earth origin, particularly the Laplacian hypothesis. Then follow evidencies obtained from astronomical studies which bear upon theories of earth origin. Subsequently, in considerable detail, a description is given of the mechanical processes by which the material of our solar system may have originated and evolved and by which the earth may have developed its present mass and major features and have come to be the home of living things.

V. C. FINCH.

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